

USE OF CHLORINE DIOXIDE FOR LEGIONELLA TREATMENT

Rule Affected: Title 30 Texas Administrative Code (30 TAC) §290.42(e)(3)(G)

Background

Chlorine dioxide (ClO_2) is an extremely powerful oxidant that can be used to improve the aesthetic, chemical, and microbiological quality of drinking water. The proper use of ClO_2 can reduce taste and odor complaints, improve iron and hydrogen sulfide concentrations, and improve the coagulation process at surface water treatment plants. It does not form halogenated disinfection by-products such as trihalomethanes and haloacetic acids, and is a very effective disinfectant. However, elevated levels of ClO_2 and its principal byproduct chlorite (ClO_2^-) can have their own adverse health effects. Consequently, the Texas Commission on Environmental Quality (TCEQ) has adopted the following guidance to ensure that only well-operated, high-efficiency ClO_2 generators are utilized by public water systems (PWS). The safety and efficacy of ClO_2 for Legionella control has shown that a significant reduction of Legionella organisms in hot water lines can be achieved by ClO_2 treatment. ClO_2 application was found to be safe based on the Environmental Protection Agency (EPA) maximum residual disinfectant level (MRDL) for ClO_2 , and maximum contaminant level (MCL) for chlorite (ClO_2^-). The impact of pH, temperature and total organic carbon (TOC) on ClO_2 decay were investigated in the field. Temperature and TOC are both important factors governing ClO_2 demand in hot water systems.

Guidance

1. Before placing a chlorine dioxide generator into service for control of Legionella, a PWS must submit an exception request to the address below:

Technical Review and Oversight Team (MC 159)
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711-3087

The exception request submittal must include:

- a. The name and specifications for the chlorine dioxide generator proposed for use;
- b. Information on the operation and maintenance in-house training program;
- c. The expected total applied dosage of chlorine dioxide and other disinfectants as well as the points of application for all disinfectants and the type and amount of residuals and by-products expected in the distribution system;
- d. Name and qualifications of the individual(s) expected to perform routine analytical efficiency testing. [Lab testing must be completed by a trained plant operator who holds a Class C or higher water works license.];

- e. A description of the containment facilities for the sodium chlorite tanks. Containment facilities for a single container or for multiple, or interconnected containers must be large enough to hold the maximum amount of chemical that can be stored with a minimum freeboard of six vertical inches or to hold 110% of the total volume of the container(s), whichever is less, as specified in 30 TAC §290.42(f)(1)(e)(ii)(1); and,
 - f. The chlorine gas equipment must have a capacity of at least 50% greater than the highest expected dosage to be applied at any time as specified in 30 TAC §290.42(e)(3)(A).
2. Upon receipt of the exception approval to use a chlorine dioxide generator for legionella treatment, sealed, signed, and dated engineering plans and specifications are **not required** to be submitted.
 3. Upon approval for the use of a chlorine dioxide generator, the system will receive a ClO₂ Verification Form (VF) from the TCEQ. Once all employees at the system which will handle and/or conduct the mandatory chlorine dioxide and chlorite testing have been properly trained on the production and testing equipment, this form must be signed by a manager or the chief operator in charge and returned to the TCEQ Technical Review and Oversight Team (see exception letter for mailing instructions).
 - a. The utility must keep an updated copy of the ClO₂ Verification Form (including future employee trainings) in their files for as long as the system utilizes a chlorine dioxide generator, and present this information to TCEQ staff upon request.
 - b. A utility, which does not use chlorine dioxide for disinfection, can utilize ClO₂ generators once ClO₂ Verification Form is submitted to the TCEQ's Technical Review and Oversight Team.
 - c. The TCEQ will retain the original ClO₂ Verification Form in the exceptions public folder with the label "Exception."
 4. All systems using ClO₂ as a disinfectant or just for process treatment must complete and submit a Chlorine Dioxide Monthly Operating Report (ClO₂MOR). The Chlorine Dioxide MOR (TCEQ-0690) is an Excel97 spreadsheet that automatically performs calculations. An electronic copy as well as the instructions for completing the ClO₂MOR¹ can be downloaded at the TCEQ website.

Please note that per §290.110 and §290.114, the following monitoring requirements are imposed on all systems using chlorine dioxide:

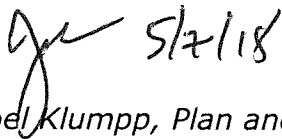
- a. The system must complete a ClO₂MOR for each entry point supplying water with chlorine dioxide to the distribution system. If all of the treatment plants utilizing ClO₂ lead to the same entry point, then the system will only have to fill out one ClO₂MOR per month. If a system has multiple plants utilizing ClO₂ and the effluent from each plant flows to the distribution system through a different entry point, the system will need to complete a ClO₂MOR for each entry point from each plant.
- b. Per the ClO₂MOR instructions, the system must perform the following sampling for each entry point through which water containing chlorine dioxide flows:

- i. The system must collect one sample per day from the point of entry (POE) (leaving the hot water tank) to be analyzed for ClO₂. If the ClO₂ residual is 0.8 milligrams per liter (mg/L) or greater at the POE, the system must collect three samples from the distribution system to be analyzed for ClO₂. The locations and timeframes for the collection of these samples can be found in the ClO₂MOR instructions.
 - ii. The system must collect one sample per day from the POE (leaving the hot water tank) to be analyzed for chlorite. If the chlorite residual is 1.0 mg/L or greater at the POE, the system must collect three distribution samples within 24 hours and have them analyzed for chlorite. The locations for these sample collections are listed in the ClO₂MOR instructions.
 - iii. The system must also collect three samples in the distribution once a month to be analyzed for chlorite for every POE that supplies water treated with chlorine dioxide. One of these sample points must be near the first customer of a plant, at a location representative of the average residence time, and at a location reflecting maximum residence time. These samples are known as a three-sample set and must be collected on the same day.
5. The system must ensure water operators maintain a free chlorine residual of at least 0.2 mg/L or a chloramine residual of 0.5 mg/L (measured as total chlorine) from the cold water system in the far reaches of the distribution system at all times as specified in 30 TAC §290.46(d)(2). The chlorine dioxide residual of the water entering the distribution system must not exceed a MRDL of 0.8 mg/L. The chlorite concentration residual of the water entering the distribution system must not exceed a MRDL of 1.0 mg/L.
6. The system must comply with the chlorine dioxide and chlorite monitoring requirements detailed in the *Summary of Additional Monitoring and Reporting Requirements for Public Water Systems Using Chlorine Dioxide* document. This document is included in the letters to systems granting exceptions for the use of chlorine dioxide.
7. The system must develop and submit a revised "Monitoring Plan" that includes the chlorine dioxide and chlorite monitoring locations as required in 30 TAC §290.121. Further information can be found in Regulatory Guidance (RG) 384 "[How to Develop a Monitoring Plan for a Public Water System](#)" ⁱⁱ and at the TCEQ's website.
Please submit an updated monitoring plan to the address below:

Monitoring Plan Coordinator (MC-155)
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, TX 78711-3087
8. The system must identify the location of the reduced-pressure zone backflow prevention assemblies to be installed on the potable water feed line(s) for the chlorine dioxide. Make-up water supply lines to chemical-feeder solution-mixing chambers shall be provided with an air gap or other acceptable backflow prevention device, as specified in 30 TAC §290.42(d)(2).

9. Amperometric titrators must be equipped with platinum-platinum electrodes as specified by the requirement in 30 TAC §290.110(d)(5).
10. The system shall ensure that the gas chlorination facility meets the applicable requirements listed in 30 TAC §290.42(e) and (f). All chemical storage and feed facilities must comply with 30 TAC §290.42(f).
11. All chemicals used in the generation of chlorine dioxide must conform to NSF International Standard 60 and be certified by a testing organization accredited by ANSI as specified in 30 TAC §290.42(j).

Finalized and Approved by:



Joel Klumpp, Plan and Technical Review Section Manager, 05/07/2018

If no formal expiration date has been established for this staff guidance, it will remain in effect until superseded or canceled.

Revision History:

Date	Action	Action by
10/12/2017	Reviewed	Mark Mikol
12/01/2017	Reviewed	Sylvana (Sam) Turner
3/11/2018	Revised	Stephanie Escobar
05/07/2018	Approved	Joel Klumpp

ⁱ <http://www.tceq.texas.gov/drinkingwater/swmor/swmor/swmor-forms-and-instructions#CLO2MOR>

ⁱⁱ https://www.tceq.texas.gov/drinkingwater/presentations/monitoring_plans/monplan.html